Muon Campus

Chris Polly

P5 Meeting at BNL

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U.S. DEPARTMENT OF ENERGY

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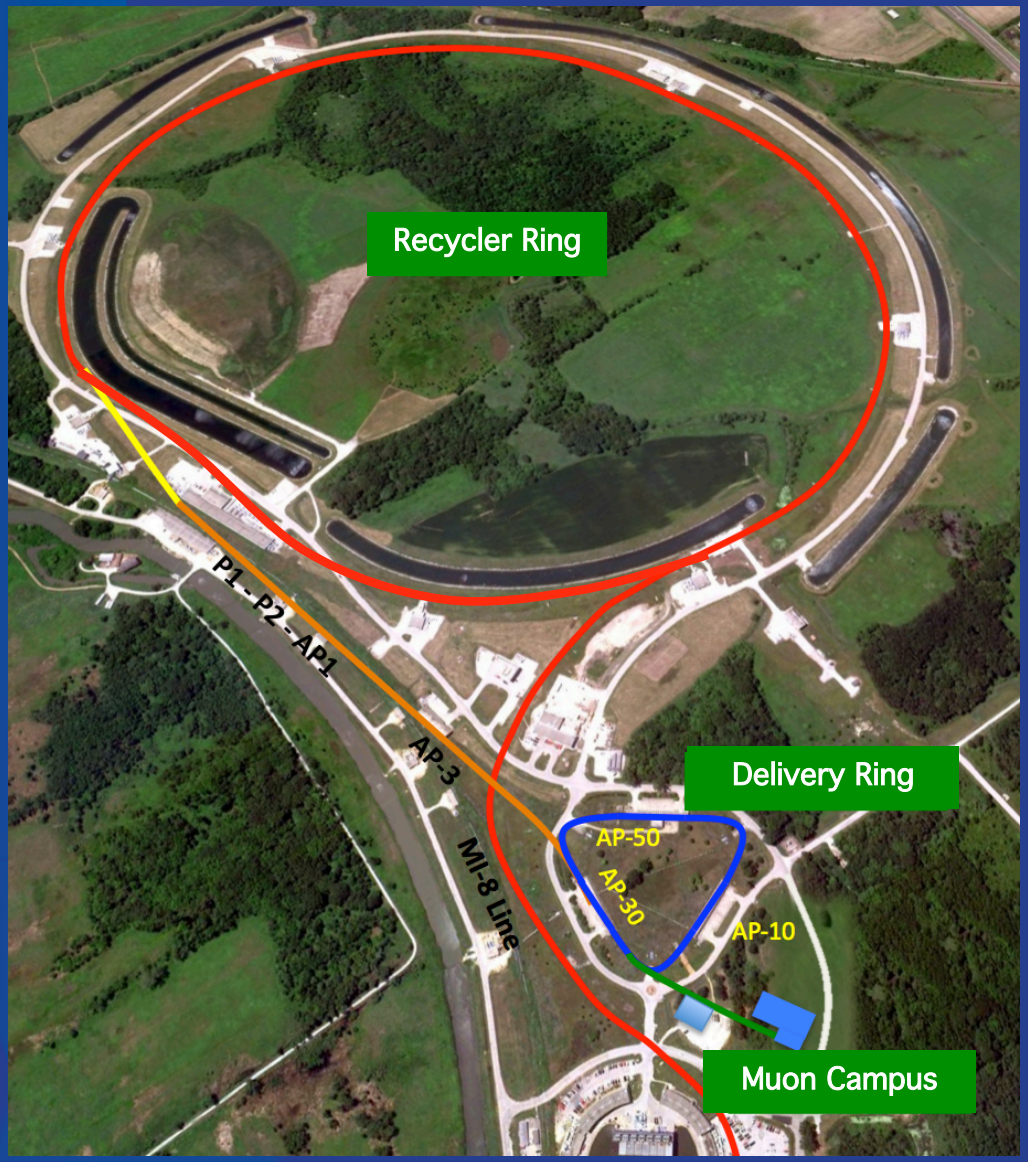
What is the muon campus?



A collection of infrastructure upgrades required to convert the former anti-proton source into a world-class muon source

First customers to take data
- Muon g-2 (2016)
- Mu2e (2020)

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Intensity Frontier Facility Upgrades

Managed as a collection of AIPs & GPPs to meet the combined specs and timelines

AIP = Accelerator Improvement Project
GPP = General Plant Project

Beam Transport AIP:

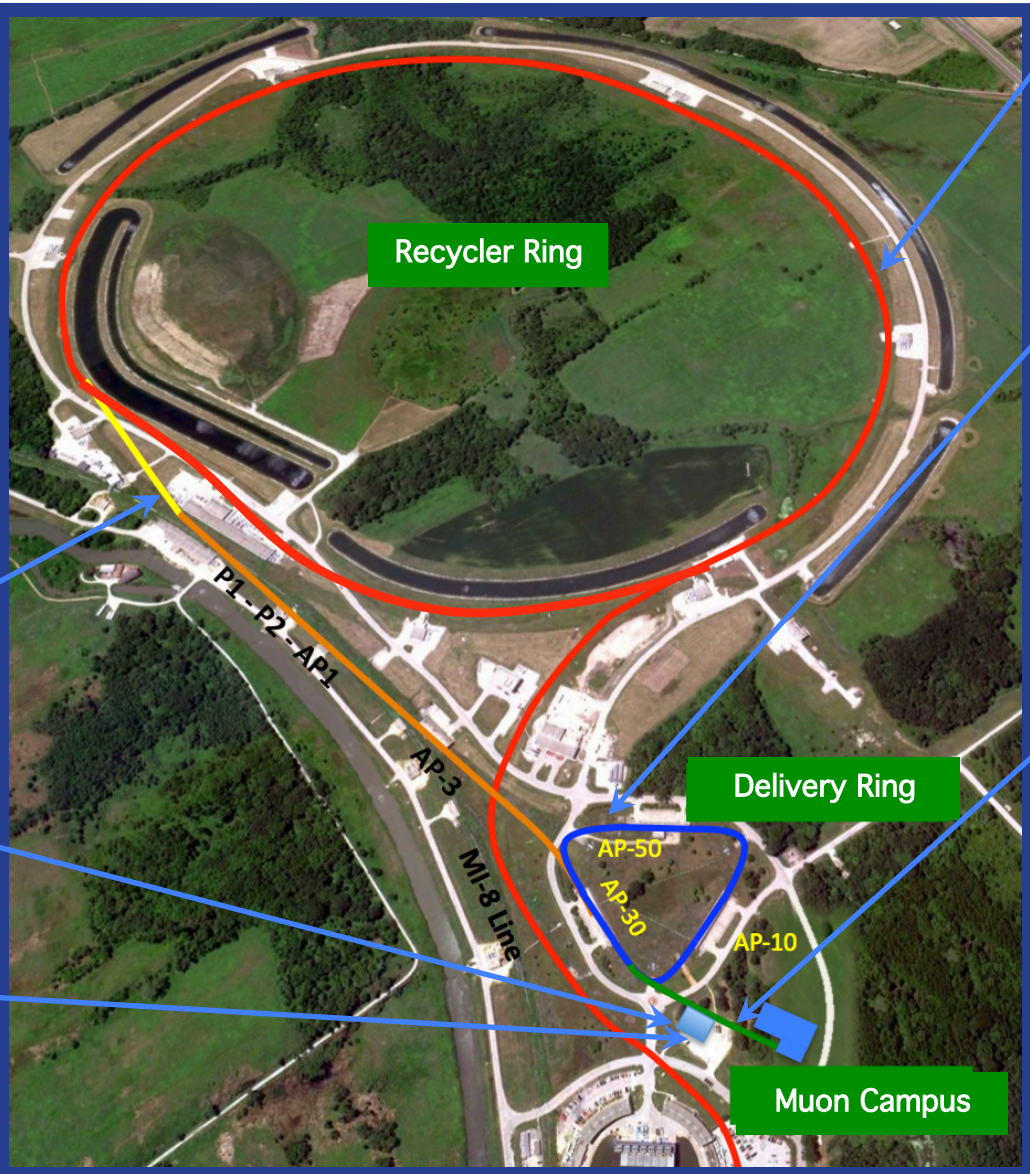
New connection from Recycler to Delivery Ring, improve apertures

MC-1 Building GPP:

Houses cryo plant, power supplies for beams, g-2

Cryo Plant AIP:

Cryogenics to both experimental halls



Recycler RF AIP:

Adds RF capability to Recycler meeting g-2/ Mu2e specifications

Delivery Ring AIP:

Modify Delivery Ring to deliver custom beams to the muon experiments

Beamline Enclosure GPP:

New tunnel to Muon Campus

Infrastructure Upgrades:

Cooling for A0 compressors, MI-52 building extension, added feeder if needed

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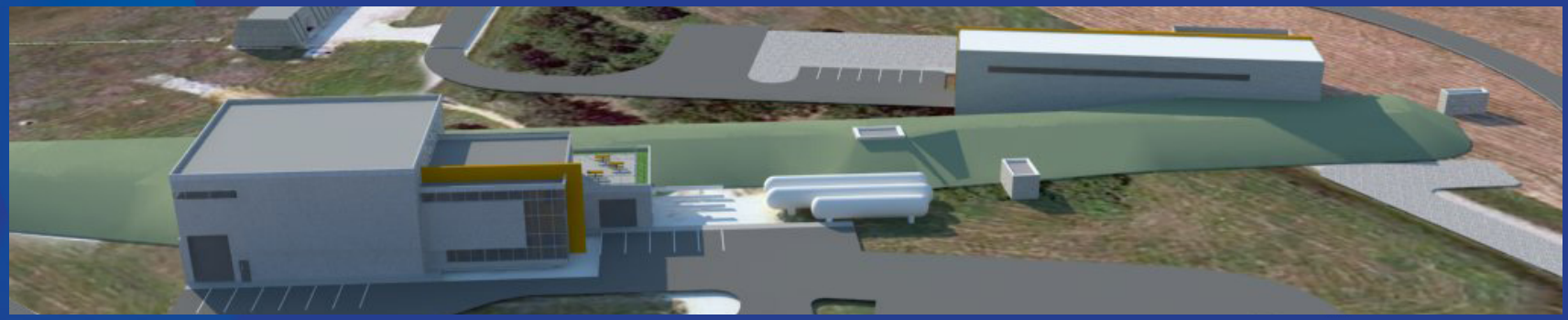
The Muon Campus optimizes g-2 + Mu2e

- → Removes previous conflicts
- → Maximize shared infrastructure, e.g. one new beam tunnel, one shared cryo plant, one new RF system
- → Cost and schedule optimized for the two experiments

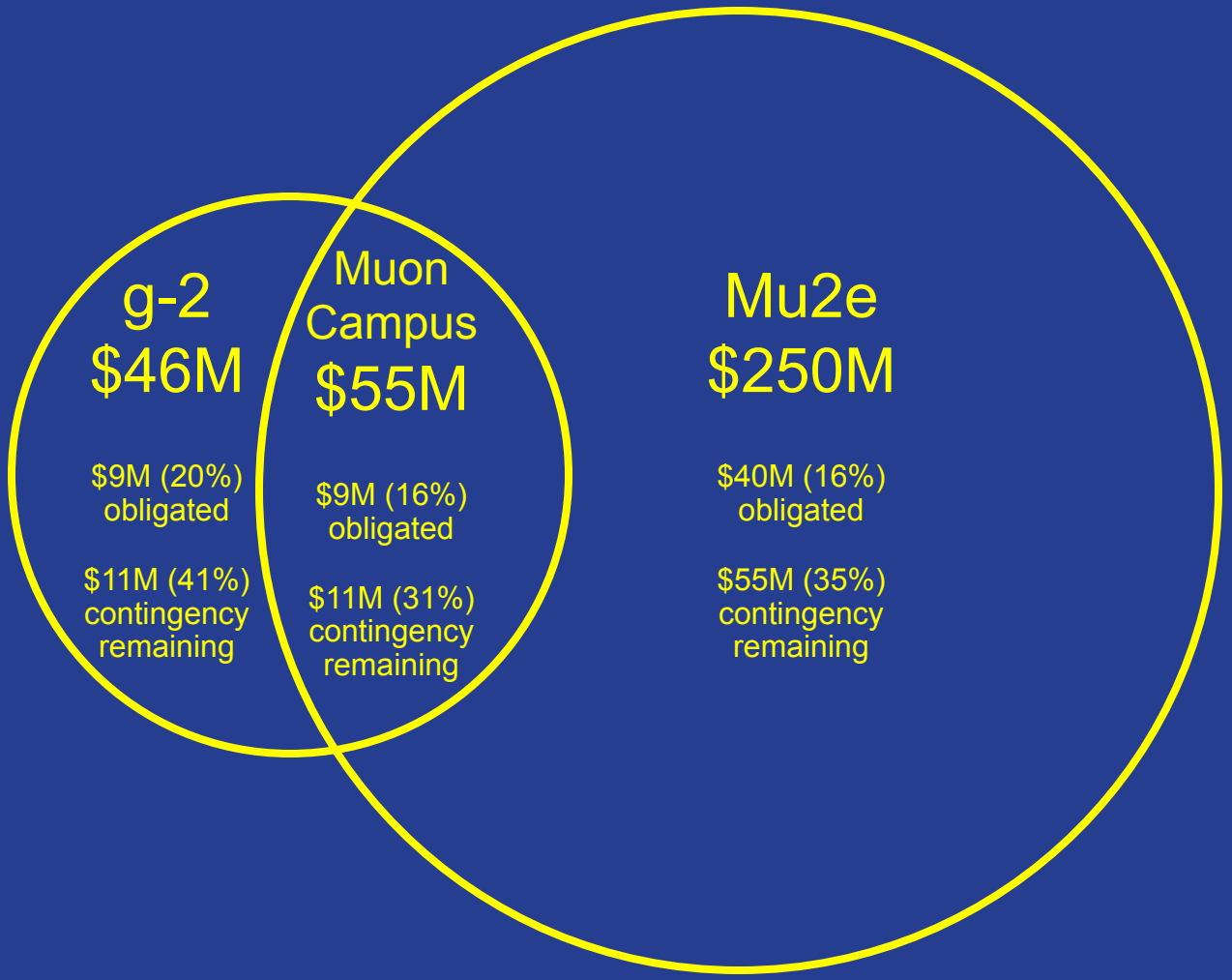
Capitalizes on >$100M of existing equipment

- g-2 ring
- g-2 beamline
- Debuncher Ring
- Magnets, pumps, stands and other Accumulator Ring components
- AP transfer lines
- AP-0 Target Station
- AP-2 beamline magnets
- Main Injector RF ferrites
- Tevatron satellite refrigerators
- Tevatron N_2 and He storage tanks
- Tevatron cryo line
- Tevatron High Temperature Superconducting leads
- Tevatron vacuum equipment
- Tevatron loss monitors
- Tevatron BPM electronics
- Tevatron electronics crates
- Tevatron control cards
- Tevatron damper system
- Misc. Tevatron Instrumentation
- Shielding steel
- Transformers



Total cost of the muon program

- Muon Campus and experiments fully-costed and thoroughly reviewed, $350M TPC
- Includes $77M in contingency
- $58M spent to date



* Actual year dollars

Funding profile (inferred schedule)

Fiscal Year	2012	2013	2014	2015	2016	2017	Total
MC-1 Building GPP	0.5	7.5	1.0				9.0
Beamline Enclosure GPP		0.4	3.7	5.6			9.7
MC Infrastructure GPP			0.5	0.5			1.0
(feeder if needed)						1.1	1.1
Cryo AIP		1.1	5.1	1.3	0.8	1.4	9.7
Recycler RF AIP		0.4	1.0	3.8	3.4		8.6
Beam Transport AIP		0.2	2.5	3.7	0.3		6.6
Delivery Ring AIP		0.1	1.9	2.8	4.3	0.5	9.5
Muon Campus TPC	0.5	9.6	15.6	17.7	8.8	3.0	55.2

- → Note FY13 focus on MC-1 Building with Cryo plant next priority
- → Part of overall schedule coordination since these two are on the critical path for g-2 to be ready for data in 2016

* Actual year dollars

Progress on the MC-1 Building GPP

- Beneficial occupancy of low-bay in Jan 14 for cryo plant construction
- Beneficial occupancy of high-bay in March to start reassembly of g-2 storage ring

Progress on the Cryo Plant AIP

Recycling Cryo Distribution Components

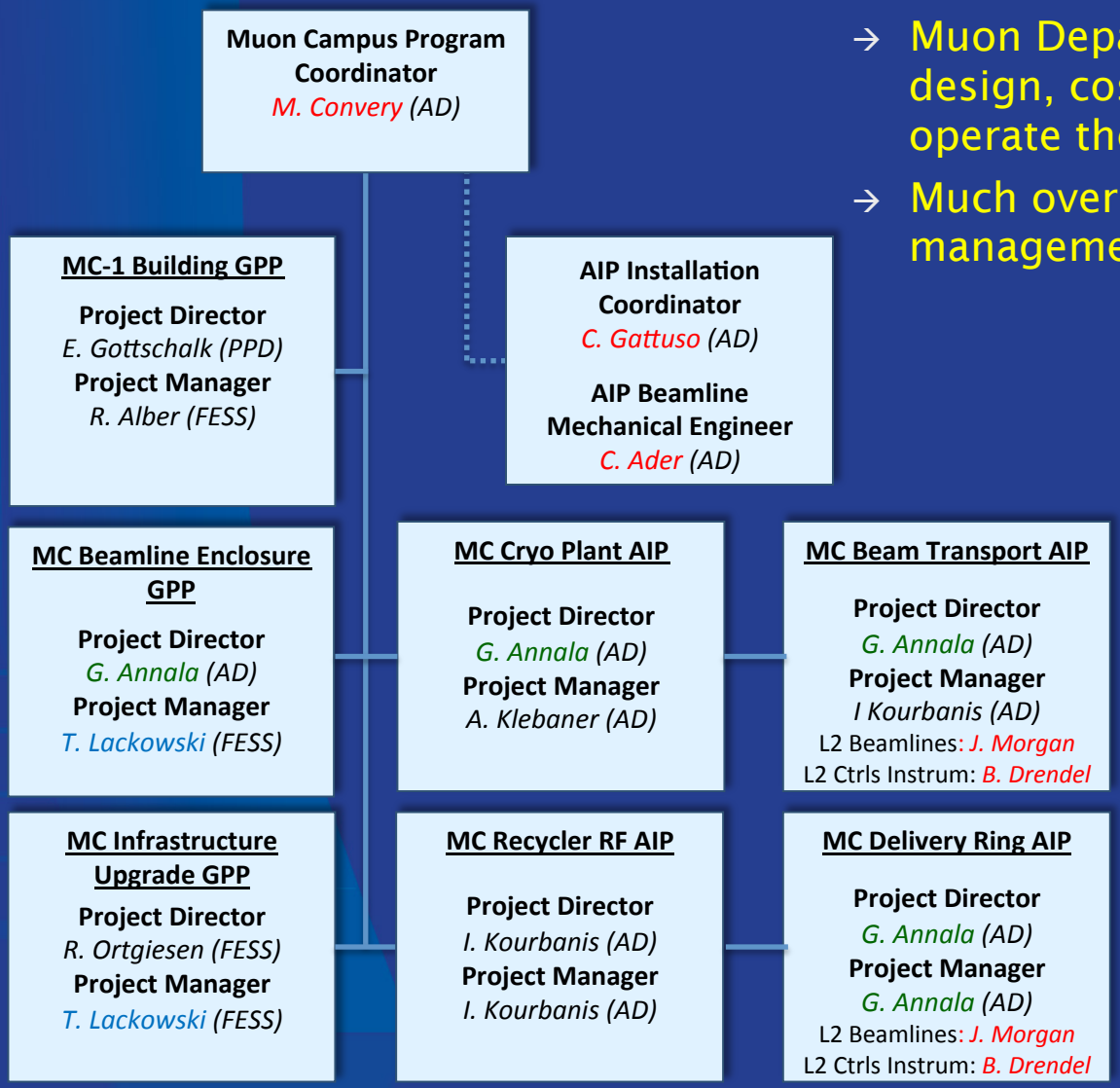
Pipework to bring compressed He
to liquification plant in MC-1 building

Control Systems

Conclusions

- The Muon Campus provides the infrastructure needed to morph the anti-proton source into a versatile facility capable of delivering highly customized beams to experiments
- The plan has been optimized to minimize the total cost of g-2 and Mu2e and allow the facility to conveniently switch between the beam delivery modes
- The schedule has been optimized to meet the g-2 and Mu2e technically-driven schedules
- The program is well underway
  - Substantial design work completed on all parts, independent cost and technical reviews conducted, program plans approved
  - MC-1 building ready for occupancy in the first quarter of CY 2014

Muon Campus AIP & GPPs



- → Muon Department formed at Fermilab to design, cost, implement, and eventually operate the muon program
- → Much overlap between the Muon Campus management and the g-2 and Mu2e projects